MIDWEST CHP APPLICATION CENTER

In Partnership with the US DOE

combined heat & power in healthcare

Northwest Community Hospital

4.6 MW CHP Application

Project Profile

Quick Facts

Location:
Arlington Heights, Illinois
Facility Type:
Hospital
Facility Size:
1,000,000 square feet
563 beds
CHP Generating Capacity:
4,600 kilowatts
Prime Movers:
Three (3) 1.1-MW Waukesha VHP Rich-Burn Engines… (installed 1997)
One (1) 1.1-MW Waukesha APG1000 Enginator™ … (installed 2005)
Primary Fuel:
Natural Gas
Heat Recovery Applications:
- Domestic Hot Water
- Space Heating
- Absorption Cooling
- Medical Equipment Sterilization

Heat Recovery:
125 psig steam @ 6,000 lb/hr
Began Operation:
August 1997

Project Overview

Northwest Community Hospital (NCH), located in Arlington Heights, Illinois, a northwest suburb of Chicago, currently operates a 4.6-MW combined heat and power (CHP) system that provides domestic hot water, space heating, and absorption cooling to the 1,000,000 square foot facility. A 3.45-MW CHP system was initially installed in 1997 by Ballard Engineering Inc. of Rockford, Illinois, as part of a new centralized plant building. The original CHP system incorporated three 1.1-MW Waukesha VHP rich-burn engines that provided a total 6,000 lb/hr of 125 psig steam. In 2005, a fourth Waukesha engine unit, a prototype design boasting 20% higher electric efficiency, was added to the existing system for a total generating capacity of 4.6-MW. The 4.6-MW CHP system now supplies nearly 100% of the maximum daytime electric loads.

Centralized Building Plant

Hospital Expansion & Aging HVAC Equipment

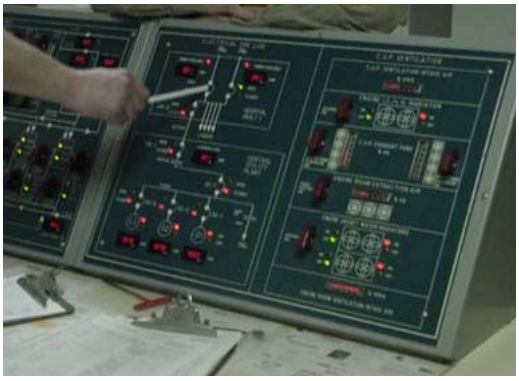
In the mid-1990s, NCH investigated the feasibility of a CHP system when it realized it had to address its 30-plus-year-old heating and cooling plant. The hospital would be embarking on a 210,000 square foot expansion and realized that over the years, decentralized heating and cooling elements were added to accommodate growing needs but were now over-burdened, undersized, and environmentally unfriendly. Steam loops were incompatible, chilled-water hydronic flows were problematic, and the equipment rooms lacked space for additional hardware. The entire mechanical plant would require an overhaul. After reviewing several options, NCH decided to centralize all of the hot water, heating and cooling equipment into a 20,612 square foot building. CHP proved to be an attractive option to reduce heating, cooling, and electric utility costs. According to Charlie Stevenson, Director or Plant Operations, "Bottom line was the incremental cost to add three engines to our already centralized plant was going to be just $2,057,000. That would give us a payback of 2.85 years, and, from our perspective, you just have to do that." NCH was already contemplating a $112 million capital investment for the hospital expansion; therefore an additional $2 million would barely reach the radar screen. The CHP system would also provide dramatic savings and a three year return on investment – a clear winner.

CHP Approval Process

The approval process began with the hospital's vision and risk assessment of the existing infrastructure system (age of equipment, reliability, efficiencies, maintenance costs and utility costs)

- The initial stage included searching for a design-build team with experience in mechanical and CHP design/construction; hence Ballard Engineering Inc.
- The team consisted of Northwest Community Hospital Senior Management, Facility Staff and Ballard Engineering.
- Several options were considered including centralized vs. decentralized utility plant with or without generation.
- The Board of Directors approved the project in December of 1995
- Authorization was granted by the Illinois Health Facilities Planning Board in October 1996 and construction began immediately.
- The Central Utility CHP Plant was operational in August 1997.

Waukesha VHP Rich Burn Engine



Control Panel

System Equipment

- (1) 1150 kW Waukesha APG1000 Enginator™
- (3) 1150 kW Waukesha 1,200 RPM VHP rich burn NG fired engines
- (3) Cain heat recovery units producing 6,000 lb./hr. total of 125 psig steam for heating and cooling
- (3) 600 H.P. fire-tube dry back two pass boilers with non-condensing exhaust heat recovery (one unit for redundancy)
- Programmable logic controller controlling CHP system for optimum economic performance
- (1) 850 ton two stage steam absorption chiller
- (2) 1250 ton electric centrifugal chillers
- (1) 240 ton rooftop compression chiller for winter cooling requirements in north wing surgical suites
- Tunnel connecting central utility plant to hospital facility; used as conduit for all piping tie-ins to existing steam, chilled water, piping, etc. into hospital rooms.

Other Notes

- In 1998, NCH received an ASHRAE Excellence in Engineering Award for its innovative energy-saving investment incorporating CHP.
- Waukesha's local vendor, Charles Equipment Company, provides NCH's preventive maintenance and all other servicing. Annual maintenance costs vary depending on operational hours logged and the whether a top-end or major overhaul is required.
- 4th engine unit serves as a pre-production test site for the engine manufacturer operating 24/7 for a full year with the supplier footing most of the natural gas bill.

For further information, contact:

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"We said, 'Well, if we're going to centralize it all, doesn't it make sense to do a CHP—and generate our own electricity, to reduce our demand load, and then capture the heat of those engines and utilize all that for heating and/or cooling?' "

Charlie Stevenson
Director of Plant Operations
Northwest Community Hospital

"The beauty of this CHP to him was not simply the return for the cogen system, but the fact that these savings would pay for the central energy plant too."

"The whole theme of it was, basically, 'We can get this built, we can get all the equipment in it—and it will pay for itself,' "

Joe Sinclair
Ballard Engineering